Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NAOHISA KOMETANI, KOICHI UENO and KOJI ECHIGO

Appeal No. 95-0938
Application 07/796,310[1]

ON BRIEF

Before BARRETT, LEE and TORCZON, Administrative Patent Judges.

LEE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 6-11. No claim has been allowed.

References relied on by the Examiner

Sakai et al. (Sakai) 5,067,374 Nov. 26, 1991

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[1] Application for patent filed November 22, 1991.

The Rejections on Appeal

Claims 6-11 stand finally rejected under 35 U.S.C. § 102(e) as being anticipated by Sakai.

The Invention

The invention is directed to a method and apparatus for executing fuzzy reasoning. According to claim 7, there is one fuzzy rule group and a plurality of fuzzy sets which correspond to the fuzzy rule group. A fuzzy set is selected at the time of execution of fuzzy reasoning and is combined with the fuzzy rule group. The combined fuzzy rule group and fuzzy set is executed. According to claim 9, a plurality of fuzzy rule groups is prepared and a plurality of fuzzy sets which correspond to the plurality of fuzzy rule groups is also prepared. A fuzzy rule group and a fuzzy set are selected at the time of execution of fuzzy reasoning and are combined with each other. The combined fuzzy rule group and fuzzy set is executed. According to claim 11, a plurality of fuzzy rule groups and a plurality of fuzzy sets are stored. A fuzzy rule group and a fuzzy set are then designated. A condition frame is stored which includes the

designated fuzzy rule group, the fuzzy set, and actual values as applied to the designated fuzzy rule group. Based on the condition frame, the designated fuzzy rule group and fuzzy set are combined. The combined fuzzy rule group and fuzzy set is executed.

All other claims depend from either claims 7, 9 or 11. Independent claims 7, 9 and 11 are reproduced below:

7. A fuzzy reasoning method for executing a fuzzy reasoning in a fuzzy reasoning application, comprising the steps of:

preparing a fuzzy rule group, and also preparing a plurality of fuzzy sets which correspond to said fuzzy rule group, for said fuzzy reasoning application, each of the fuzzy sets including a plurality of membership functions,

dynamically selecting at least one of said fuzzy sets at the time of execution of the fuzzy reasoning in response to information existing at that time,

combining the selected fuzzy set with said fuzzy rule group, and

executing said fuzzy reasoning by using the combined fuzzy rule group and fuzzy set.

9. A fuzzy reasoning method for executing a fuzzy reasoning in a fuzzy reasoning application, comprising the steps of:

preparing a plurality of fuzzy rule groups, and also preparing a plurality of fuzzy sets which correspond to the fuzzy rule groups for said fuzzy reasoning application, each of the fuzzy sets including a plurality of membership functions,

dynamically selecting at least one of the fuzzy rule groups and one of the fuzzy sets at the time of executing the fuzzy reasoning in response to information existing at that time,

combining the selected fuzzy set with the selected fuzzy rule group, and

executing said fuzzy reasoning by using the combined fuzzy rule group and fuzzy set.

11. A fuzzy reasoning system for executing a fuzzy reasoning, said fuzzy reasoning system comprising:

means for storing a plurality of fuzzy rule groups,

means for storing a plurality of fuzzy sets, each of which has a plurality of membership functions,

means for designating any of said plurality of fuzzy rule groups and at least one of said plurality of fuzzy sets,

means for storing a condition frame which includes the designated fuzzy group and fuzzy set as well as actual values applied to fuzzy rules of said designated fuzzy rule group,

means for combining said designated fuzzy rule group and fuzzy set, on the basis of said condition frame,

fuzzy reasoning execution means for executing the fuzzy reasoning which utilizes the combined fuzzy rule group and fuzzy set on the basis of said actual values, and

means for storing a result derived from the execution of said fuzzy reasoning execution means.

Opinion

We do not sustain the rejection of claims 6-11.

Regarding the relationship between fuzzy rule groups and fuzzy sets, we do not interpret any of the above-quoted independent claims 7, 9 and 11 as being so broad as to be satisfied by a fixed association or correspondence of a fuzzy set to a fuzzy rule group. Claim 7 recites a plurality of fuzzy sets which correspond to a fuzzy rule group. Claims 7 and 9 recite dynamic selection of fuzzy sets and combining the selected fuzzy set with a fuzzy rule group. Claim 11 recites designating one of a plurality of fuzzy rule groups and one of a plurality of fuzzy sets and then combining the designated fuzzy rule group and fuzzy set. While it is possible to construe all of this language as being met by a fixed correspondence of a particular fuzzy set to a particular fuzzy rule group, such as by seeing the dynamic selection or designation as a fixed and unvarying selection, such a construction of the claims is unreasonable, especially in light of the appellants' specification.

First, if the correspondence is fixed, there is no need to make dynamic selections and subsequent combinations of the selected fuzzy rule group and the selected fuzzy set. Secondly, the appellants' specification makes abundantly clear that the appellants see the problem with prior art systems as having a fixed association between a fuzzy rule group and its

corresponding fuzzy set. The specification at 2 reads as follows:

> According to the prior-art technique mentioned above, the fuzzy rules and the membership functions are statically and correspondingly defined within one pack of source knowledge in tools which build the fuzzy reasoning system. This poses the problem that when a situation in making the reasoning has changed, the produced system fails to conform to the new situation, or that the system cannot conform to a plurality of situations. In such a case, it is necessary to reproduce the system or to produce a plurality of systems. It is accordingly very difficult to cope with various situations.

It is this fixed and inflexible association which the appellants seek to avoid. The specification at 3 states:

> In the first aspect of the present invention, a plurality of fuzzy sets conforming to the sorts of situation are prepared in correspondence with one fuzzy rule group beforehand, whereby the fuzzy set to be used can be dynamically altered at the time of execution of reasoning.

Sakai does not anticipate the appellants' claimed invention because each fuzzy rule group has a fixedly corresponding fuzzy set which is not changed. While Sakai discloses an embodiment which applies multiple levels of fuzzy reasoning by use of up to

three fuzzy rule groups, each fuzzy rule group has its own fixedly corresponding fuzzy set. The appellants are correct that there is no disclosure in Sakai of selecting different fuzzy sets to correspond to the same fuzzy rule group.

The examiner cites to claim 1 of Sakai, a portion of which states:

> third means for establishing another membership function of a fuzzy set of at least one of the determined or adjusted parameters in accordance with a second set of fuzzy production rules . . .

However, the additional membership function or fuzzy set is for a second fuzzy rule group.

Also, the examiner refers (answer at 4) to column 7, lines 35-48 of Sakai as disclosing dynamic selection of a fuzzy set. However, the cited portion of Sakai discloses the selection of a particular rule within the fuzzy rule group, not the selection of different membership functions or fuzzy sets.

For the foregoing reasons, we reverse the rejection of claims 6-11 under 35 U.S.C. § 102(e) as being anticipated by Sakai.

REVERSED

LEE E. BARRETT Administrative Patent Judge	
JAMESON LEE Administrative Patent Judge	BOARD OF PATENT APPEALS AND INTERFERENCES
RICHARD TORCZON Administrative Patent Judge	

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